

A Synopsis on

# **BeSafe: IoT Based Safety Band**

Submitted in partial fulfillment of the requirements  
of the degree of

**Bachelor of Engineering**

in

**Information Technology**

by

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## CERTIFICATE

This is to certify that the project Synopsis entitled “***BeSafe: IoT Based Safety Band***” Submitted by “***Ganesh Jambuka (18104044),Krishi Shah (19204009),Riddhi Shah (19204010)***” for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Information Technology.*** to the University of Mumbai,is a bonafide work carried out during academic year 2019-2020

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## Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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# Abstract

Women nowadays do not feel safe, either inside or outside of their homes. The crime rate is high, and accidents happen on every other route for various reasons. As a result, we proposed the idea of a safety band to help women and victims in critical situations. Given the circumstances, we devised a method for a woman to obtain administrative assistance on time. The Bluetooth module will help to connect hardware with software. We used a band for hardware and a mobile software application. Our technology will help women who have been sexually harassed, as well as victims of accidents or other crises, by tracking and communicating their real-time location, to the family and the police via Short Message Service (SMS) using the Global System for Mobile Communications (GSM) module and Global Positioning System (GPS) module while the victim is in the process of being tracked. Our method helps them remember the coordinates of where they pressed the push button. All data will be stored on Firebase and analyzed before reporting to law enforcement and government agencies. Based on the investigation's findings, the police may take further actions to help the victims.

## Introduction

Women's safety is a hot topic in India. Currently, It has become a vital source of concern. The crime rate is increasing. Women are unsafe both outside and inside their homes. However, despite this fear, social activity will continue. Even if we have strict regulations, there should be adequate safety precautions that we must strictly follow to protect women from assault. Considering the above-stated circumstances, We have proposed a system that will quickly receive aid from family and the police. It is a hybrid of hardware and software that prioritises women's safety because only hardware or software won't provide complete security. The band serves as both hardware and software for mobile applications. Bluetooth enables hardware and software to exchange data. If a woman is in danger, an emergency switch located on the band should be pressed. As a result, in the event of an emergency, SMS will be sent to the user's family and police. Our system assists women who are victims of sexual harassment and is also designed to assist victims who are involved in a car accident or other crisis by tracking and sending their real-time location to the family via SMS using the GSM and GPS module when the band is connected to the application, The band will send a signal or either it will work independently. The user can send the Google Map Uniform Resource Locator (URL) link to the immediate family by pressing the push button. Our system will store the location area name where the push button was pressed, which could be useful to the police by allowing them to access data from Firebase or the application in JavaScript Object Notation (JSON) file format. This way we can help the victim when they come across any problems.

## Objectives

We have identified the following as our project objectives:

1. To achieve the location of the victim we will be using the GPS and GSM module which will help their family to locate them.

2. To achieve the current location it will be converted into a Google Map URL link and send through cross platform application to the concerned one.
3. To analyse the data/logs received from all the users so that it can be further used by police to identify the areas where emergencies had occurred with the help of bluetooth module which will send the data to the application and stored into the firebase.

## Literature Review

In 2019, S. Pandey et.al. [1] They proposed a methodology that uses an app a victim can send their location and log a complaint to a police station, family member, compatriots, and admin. The admin then forwards the victim's notification to all users within 100 metres of the victim. The App generates a unique code that allows two users to track each other. This would be more beneficial if it was completely automated and did not require monitoring. In 2018, N. R. Sogi et.al. [2]The proposed methodology uses a device for women's safety using a Raspberry Pi and a Raspberry camera module. The priority here is on helping the victim by informing the police or other designated parties of the victim's current location and information about the criminal with a single click of a button. The limitation includes the fact that this device is purposed to protect women and that obtaining assistance will be difficult due to the fixed access numbers. In 2019, V. Sharma et.al. [3]The proposed methodology consists of GSM, GPS, shock circuit, camera, Arduino UNO, and Raspberry Pi-3. When the user presses the switch, it sends the link to the guardians, with the live streaming video clips saved in the Google Drive link, activates the electric teaser for self-defence, and sends the location via the gsm module. The camera module is not able to be carried with the user. In 2019, R.R. Khandoker et.al. [4]The proposed system is an application where, if the user pushes the SOS button or yells with the voice command, the app will send an alert message to the user's registered contacts, including the user's position and record the surrounding sound for the first five minutes as a proof. The newer Android version has a restriction to listen to the sound continuously. In 2019, T. M. R et.al. [5]The authors designed a security device that included GPS, GSM, a Raspberry Pi, and various sensors. The smart band will provide the user's location and physical condition to the user's guardian and police. The proposed device is not wearable, it takes up a lot of space, and people cannot carry the band around. In 2019, S. Khanam et.al. [6]They proposed a better approach that uses a high voltage current producing circuit to stun the opposition for a few seconds. The fingerprint module for device activation and the GSM/GPS module for alerting and location tracking were all interfaced with a microcontroller to create a small baton-shaped device that is handy and portable. If there are too many people, it may be hard to use. In 2019, T. Sen et.al. [7]The proposed methodology uses a device that ensures women safety in three ways. They designed a mobile application that uses voice recognition. This device sends an alarm message to a pre-programmed number, rings the bell, records video, and aids in communication with an emergency number. It does not ensure the user's complete safety. The design is a little heavy, making it unwearable. In 2020, A. Anand et.al. [8]The proposed system uses Firebase, Twilio, MapBox API in their application. They have designed a crowdsourcing application. Whenever the user is in trouble and presses the SOS button, It will notify other users nearby by sending the real-time location. The MapBox API update's

position on an hourly basis of the user. But it has privacy concerns where other individuals may become a threat. In 2020, H. Chaudhary et.al. [9] The proposed system uses a band for children and GPS-enabled smartphones for parents to track their children's positions. The child's finder can utilise the information stored on the wristband to locate the youngster. The band has parents contact information, as well as a QR code. The app's difficulties include the lack of automatic calling to responsible persons when the system detects the youngster has gone missing. In 2020, Z.A.M. Fernandez et.al. [10] The proposed system used Artificial Intelligence for Speech Recognition, Accelerometer and Gyroscope for human activity recognition. The Application will detect the dangerous situation. The Algorithms will recognise the condition and forward it to a Firebase that will send alert messages with GPS Coordinates and the recorded video link. But it doesn't provide the specific places with the most insecure and finding strategies to put users in a safer situation. In 2020, A. Z. M. Tahmidul et.al. [11] The proposed methodology is an Android app and an Internet of Things (IoT) device to make women's movement safer. The app also provides the user with the location of the nearest safe zone. The app can transmit a notification to the nearest police station and volunteer support. The software has a flaw that causes the transmission of SMS to volunteers in a different zone. In 2020, V. Mishra et.al. [12] The proposed system uses SQL for the database, voice recorder, and GPS for getting coordinates. It gathers the required information, like personal and contact details. The application is activated when the user shakes the phone, uses voice, or presses the button present in it. It sends the latitude and longitude coordinates to the contacts via SMS and records audio for proof. The system could have sent the map URL link instead of sending the latitude and longitude coordinates. In 2020, D.V. Savla et.al. [13] They designed a safety band that uses data thresholding algorithms and a Wi-Fi-enabled microprocessor to detect falls. If there is a fall or spike, the server starts a 30-second timer. The user can cancel the emergency using the cancel button while the timer is still running. It conveys the nature of the crisis, user information, and precise position. The system can introduce a mobile app with live tracking and additional data analytics. In 2020, D. Sunehra et.al. [14] The proposed system is, implemented using the Raspberry Pi3 to improve the safety and security of women/children. It sends a buzzer alert to people who are close to the user. It locates the user using the GPS transmits via SMS to the emergency contact and police using the GSM. It interfaces with a USB Web Camera and sends an e-mail alert to the emergency contact. The system can be portable by enclosing all components in a small enclosure and using batteries. In 2021, K. Venkatesh et.al. [15] They proposed a device that has a wearable "Wrist band" that constantly communicates with a smartphone. The device includes a trigger, GSM module (SIM800), GPS module (Neo-6M), IoT module (ESP-12E), Neuro Stimulator, Buzzer, and Vibrating Sensor. The IoT device helps to track the surroundings and inform the internet tab. The proposed device is not wearable, it takes up a lot of space, and people cannot transport it.

The application developed will be a cross-platform application. So, It can run on both IOS and Android. The app will send the Google Map URL links instead of coordinates. The application will have a feature to show safer locations for the user, to get there in a dangerous situation. It will ensure the privacy of the users. The solution we proposed includes both hardware and software. The band provides hardware assistance when the victim does not have access to a mobile phone during a crisis.

## Problem Definition

Problem Identified:

- 1.The free movement of women are being hampered by sexual abuse.In the present world, sexual harassment is one of the major obstacles to women's empowerment.
- 2.The person who is in unmovable situation due to an accident or alone who needs help.
- 3.Many apps don't have calling options and only need the band to call.

Solution Proposed:

- 1.We proposed to make an app that helps the women to reach her family with single a click whenever she is in trouble.
- 2.We are also planning to create a system so, whenever a person meets with an accident can contact the concerned authority by a single click hereby sending his/her location to the police.
- 3.Our system call the person immediately without involving calling system.

## Proposed System Architecture/Working

The system we proposed includes a band and a cross-platform application for a woman to receive assistance. We prioritised women's safety above all else, so we created a system that combines hardware and software. It will assist women in a desperate situation, accident or other crisis by tracking and sending their real-time location to the emergency contacts as an SMS via the GSM module. After tracing the current location, it will be converted into a Google Map URL link and sent either by a band or a cross-platform mobile application. Our proposed system can store the GPS coordinates of the location where the victims pressed the help button so that the police can view the records for investigation purposes in the future by accessing the JSON data. In an emergency, we have two techniques in our system for ensuring the safety of female victims: an IoT-based band or a cross-platform application via a smartphone.

## Flow of Proposed Application

After starting the application, the user must register and give personal details stored in Firebase, including emergency contacts stored in the local database. The verification of the user's e-mail will be taken care of by FirebaseAuth. If the user presses the SOS button, it will fetch the coordinates with the help of Geolocator and convert them as a Google Map URL link, And then the application will retrieve contacts from the local database. The telephony package will send the message to the emergency contacts retrieved with the link present in it. Then, Geocoding will convert coordinates into sub locality names and store that data in Firebase Cloud Storage, refer the below Fig. 1. The admin can access that data from the application in a JSON file format refer Fig. 5. That will further be useful for data analysis of the most unsafe places, Which be helpful for government officials to investigate or to place CCTV cameras.

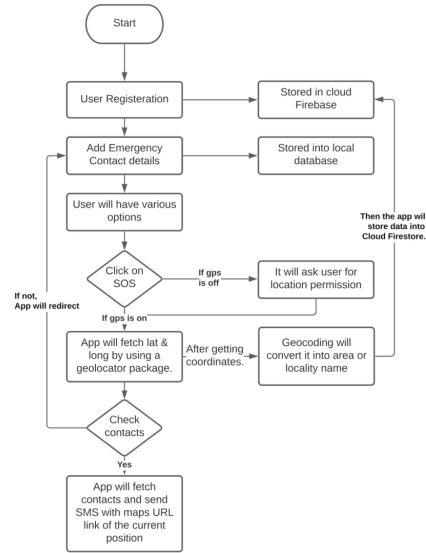


Figure 1: Flow of Proposed Application

## Flow of Proposed Band

When the IoT-based band has started, it activates all modules, including GPS, GSM, Bluetooth, refer to the below Fig. 2. After then, the band will check to see if the emergency button is active. If the victim presses the switch, the antenna will collect the signal, and then it will be monitored by the GPS module. The band must ensure that all modules have permitted if the network is not connected. When the computer shows the longitude and latitude using the signals received by the antenna, the coordinates are confirmed. When the victim is in a crisis, the coordinates are communicated to the police and emergency contacts via an SMS via GSM module in link format.

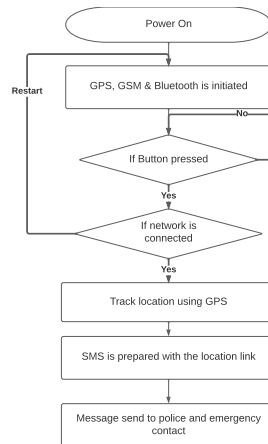


Figure 2: Flow of Proposed Band



## Flow when APP and Band are connected

When the IoT-enabled band is activated and connected to the application, the band alert all of the modules GPS, GSM, and Bluetooth. The safety band sends the Bluetooth signal to check the connection with the application. The safety band will also relay the victim's current location if the location is on. It would also communicate the location coordinates to the victim's emergency contacts. When the victim presses the SOS button, the app sends the victim's current position to the emergency contacts. Whenever the band would connect to the mobile app, the coordinates would be saved and accessed from the Firebase. Refer to the below Fig. 3.

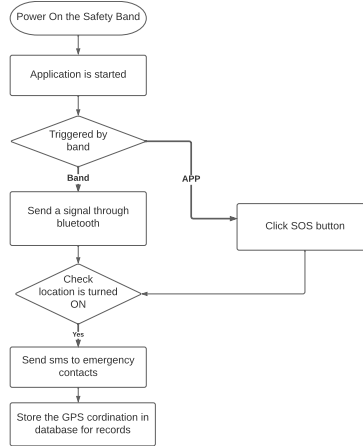


Figure 3: Flow when APP and Band are connected

## Design and Implementation

### Band Implementation

In our proposed system, The microcontroller used is the Arduino Nano. It has a wide range of applications and is a major microcontroller board because of its small size and flexibility. The GPS module gets the location information from satellites in the form of latitude and longitude. The microcontroller processes this information and sends it to the GSM modem then it sends the information as SMS to the police or immediate family. They can contact by clicking the push button in emergency such as accidents. The band send the GPS link to the contacts or concerned authorities for seeking help in emergency. The proposed system contains GSM modem which acts as a mobile phone accepts any GSM network operator SIM card with its own unique phone number. This SIM900A GSM modem can communicate and develop embedded application of SMS based remote control, as an example, to send/receive SMS and make/receive voice calls. The proposed system also contains GPS module which works on 3.3 V supply. It continuously senses the current position of the wearer and sends it automatically to the microcontroller.

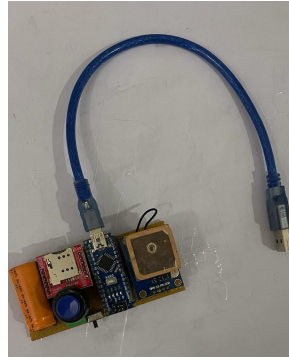


Figure 4: Prototype of IoT Band

## App Implementation

For developing the application, we have used Flutter, which supports cross-platform application development. So, It can work on both IOS and Android devices. This application is beneficial for both the user and the admin. The admin can track the location data, and the user can use it during an emergency. The main page of the app has various buttons. Each button is functional for specific things. For instance, safe places like Hospitals, Police stations and Crowded areas and after pressing the buttons, it will open up on Google Maps. The other features include emergency calls and adding contacts refer to Fig. 5. The analysis page has the characteristic to gather data in a JSON file format. The data collected during the incident will be available in Firebase. The admin can log into the application and get the location data in a JSON file created in internal storage with the help of the application. The admin can do data visualization of the JSON file refer below to Fig 5. That report can be helpful for government officials for taking further actions in that area, i.e., placing CCTV cameras, more street lights etc.

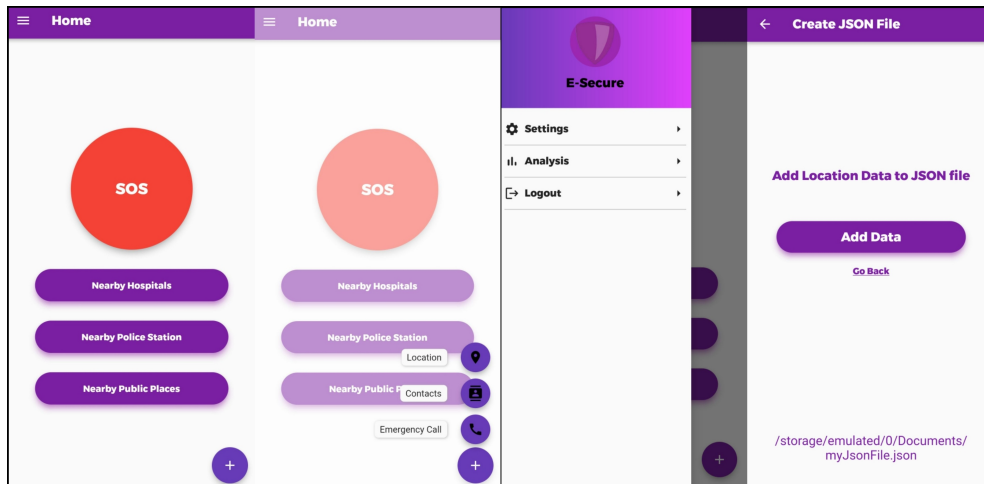


Figure 5: Application Design

## Summary

Our proposed system consists of GSM, GPS, Bluetooth modules which will be integrated with Arduino nano, also a cross-platform application. We have given the highest priority to women's security, so we have designed a system with a combination of hardware and software. Our system helps women when they are involved in problems and is also made to help the victims when they come across an accident. In our system we have two approaches for safety of women victim can either use a IoT based band or a cross-platform application in emergency situation. Our system has the capability of storing the GPS coordinates/locality name of the location where the victims pressed the SOS button. The Application can also be used if the victim doesn't have a band. The victim can contact for help without actually calling by using our application and get help as soon as possible by sending the current location. It makes it easier to send the location without the attacker having any idea about it. This band can be used by anyone to contact the immediate or extended family and friends in case of emergency. It's convenient as the victim can choose whom to send the message.

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# 1 Publication

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